MINISTRY OF ENERGY OF THE REPUBLIC OF BELARUS
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BRIEF OVERVIEW OF THE ENVIRONMENTAL IMPACT ASSESSMENT DURING CONSTRUCTION AND OPERATION OF THE NUCLEAR POWER PLANT IN THE REPUBLIC OF BELARUS

Contents

1 INTRODUCTION

The environmental impact assessment (hereafter referred to as EIA) of the nuclear power plant in the Republic of Belarus (hereafter referred to as the Belarusian NPP) was conducted according to the legislation of the Republic of Belarus, including the Convention on Environmental Impact Assessment in a Transboundary Context of February 25, 1991 with regard to recommendations of the International Atomic Energy Agency (IAEA).

The EIA was prepared based on the results of the study of the current state of environment, conducted in 2009, on scientific, design and exploration work carried out during the process of selection of the location for the nuclear power plant in 2006-2008, as well as on the Fund materials.

The assessment was conducted with regard to combined environmental impact of facilities, operating or planned for construction, at the Belarusian nuclear power plant location, taking into account socioeconomic living conditions for people and their health.

The EIA materials include environmental and socioeconomic data related to the location of the nuclear power plant, findings on the compliance of the location with environmental criteria, the nuclear power plant specifications, the preliminary environmental impact assessment of the nuclear power plant, etc.

This document is intended to provide a short description of the basic EIA provisions. Detailed information is included in the corresponding EIA materials.

2 POTENTIAL LOCATIONS FOR THE NUCLEAR POWER PLANT

Initially, 74 potential locations were selected in the Republic of Belarus. 20 locations were excluded from further considerations, since they fell within the scope of prohibitory factors, set by the basic criteria and requirements for the selection of nuclear power plant locations. Thus, 54 locations were analyzed against adverse effects based on the fund and archive materials.

An expert commission was set up to reduce the volume of exploration work, which, following the analysis of hydrological, seismotectonic, environmental, aerometeorological, radiological and geotechnical data, land use conditions and additional reconnaissance field work, determined three most promising locations for detailed evaluation:

– Bykhov, (Mogilyov oblast);
– Shklov-Gorki (Mogilyov oblast);
– Ostrovets (Grodno oblast).

Three sites were chosen at these three locations in 2006-2008:

– Krasnaya Polyana site (Bykhov location);
– Kukshinovo site (Shklov-Gorki location);
– Ostrovets site (Ostrovets location).

Research work was conducted at the indicated sites to choose the priority site for the nuclear power plant construction.

2.1 Krasnaya Polyana site (Mogilyov oblast)

Faults are absent at the site, according to geophysical research and seismic prospecting. The magnitude of the design-basis earthquake is 5.0, and the maximum strength level earthquake is 6 degrees on the MSK-64 scale.

Geodesic observations show that the maximum speed of the earth crust movement on the site doesn't exceed the maximum permissible value of 10mm annually.

Geotechnical and hydrogeological explorations showed that the average strength and strong soils will be the base of the main structures. The soils bearing capacity is high. During the nuclear plant operation the activation of karst-suffosion processes is possible. Unconfined groundwater is present, at 10-15 meter depths. The site has fresh water resources (for drinking).

According to the results of hydrological study, the Dnepr river is the main source of technical water supply for the cooling system of the nuclear power plant. The length of technical water lines will be around 28 km. A back-up water reservoir can be made at the Resta river, if necessary, flooded area will be 1,45 square kilometers.

Following the results of studies of land use, radiological and industrial conditions, it was ascertained that forests cover 85% of the territory, low-productivity soils occupy 15%. The site territory is in the area of periodic radiation control. The length of approach railway lines will be around 27 kilometers, auto roads - 3 km.

There are no prohibitory factors for the nuclear power plant construction on this site. A complicating factor is the potential activation of karst-suffosion processes during the nuclear power plant operation.

2.2 Kukshinovo site (Mogilyov oblast)

According to geophysical research and seismic prospecting, the magnitude of the design-basis earthquake is 5.0, and the maximum strength level earthquake is 6 degrees on the MSK-64 scale.

According to the hydrological data the current movements of earth crust don't exceed the permissible levels.

Geotechnical and hydrogeological explorations showed that the average strength and strong clay and sand soils will be the base for the main structures. On the largest part of the territory sand soils lay on dolomites which may trigger activation of karst-suffosion processes. The soils bearing capacity is high. Groundwater is confined. Piezometric levels are set at 1,5-3.6 meters from the surface which requires deep dewatering during construction. The site has fresh groundwater resources (for drinking).

Following the results of hydrological study, the Dnepr river is the main source of technical water supply for the cooling system of the nuclear power plant. The length of technical water lines will be around 26 km. A back-up water reservoir can be made at the Pronya river, if necessary, flooded area will be 1,0 square kilometer.

The study of land use conditions showed that forests cover 26% of the site territory, pasture – 74%. This site doesn't belong to areas of radioactive pollution.

The length of approach railway lines will be around 4 kilometers, auto roads - 4 kilometers.

There are no prohibitory factors for the nuclear power plant construction on this site. A complicating factor is the potential activation of karst-suffosion processes during the nuclear power plant operation.

2.3 Ostrovets site (Grodno oblast)

According to geophysical research and seismic prospecting the magnitude of the design-basis earthquake is 6.0, and the maximum strength level earthquake is 7 degrees on the MSK-64 scale which doesn't affect safety as the modern nuclear power plants are designed for 8 degrees on the MSK-64 scale.

According to the hydrological data the current movements of earth crust don't exceed the standard values.

Geotechnical and hydrogeological studies showed that the average strength and strong clay and sand soils will be the base for the main structures. The soils bearing capacity is high. Groundwater is unconfined and is situated at depths over 15 meters. The site has fresh groundwater resources (for drinking).

Following the results of the hydrological study, the Viliya river is the main source of technical water supply for the cooling system of the nuclear power plant. The required charge volume for two power units is 2,54 m^3/s. The length of technical water lines will be around 6 km. A back-up water supply source is available - the water reservoir of the Olkhovskaya hydroelectric power plant (5.4 km^2).

The study of land use showed that arable lands cover 90% of the territory. This site doesn't belong to areas of radioactive pollution.

The length of approach railway lines will be around 32 kilometers, auto roads – 4 kilometers from the route P-48 Vilniius-Glubokoye-Polotsk.

There are no prohibitory or adverse factors for the nuclear power plant construction.

2.4 Analysis of the conducted design and exploration work to select the priority site.

The results of the comparative assessment show:

- There are no prohibitive factors (i.e. factors/conditions which forbid the construction of the nuclear power plant in accordance with the regulatory documents) for all three competing sites;

– There is potential for the activation of karst-suffosion processes at the Krasnaya Polyana and Kukshinovo sites which is a complicating factor. Geotechnical and hydrological conditions of the Kukshinovo site are complex (soils deposits have various structures and properties, characterized by the lack of a consistent pattern, confined water is present, its piezometric level is set close to the land surface, up to 1,5 meter). Some adverse effects can be eliminated (compensated) by appropriate expensive technical methods;

– On the aggregate basis of vital factors, the Ostrovets site has advantages over the Krasnaya Polyana and Kukshinovo sites.

With regard to the foregoing and IAEA recommendations, taking into account the importance of safety issues, the Ostrovets site has been identified as the priority (main) site.

3 BRIEF DESCRIPTION OF THE NUCLEAR POWER PLANT PROJECT

The Russian project of the third generation Nuclear power plant - 2006 with water-water energy reactors (hereafter referred to as PWR) was adopted for the Belarusian nuclear power plant following the results of the analysis of the available projects. Reactors of the third generation have enhanced safety and reliability. This project complies with modern international requirements on nuclear and radiation safety. The nuclear power industry will develop in this century using improved reactors of the third generation.

The advantage of the Nuclear power plant – 2006, if compared with other projects, is that the main equipment and safety systems of a nuclear power plant were tested at operating nuclear power plants. The closest prototype of the Nuclear power plant -2006 was put in commercial service in 2007 in China (2 energy units). Based on Russian projects of the third generation the construction of two power units is being completed in India, the construction of two power units has been started in Bulgaria and of four power units - in Russia.

According to the Russian legislation, the Russian Federation can accept for long-term storage and further processing on its territory the spent nuclear fuel, if the original nuclear fuel was delivered by the Russian Federation.

The peculiarity of the nuclear power plant – 2006 project is a new reactor facility with additional safety systems:

- passive heat removal system;
- shell medium discharge and purification;
- double protective hermetic shell;
- in case of an accident beyond the design basis – a trap for molten fuel.

To enhance reliability of the power unit the following features are provided:

- implementation of improved security system, based on passive and active devices which allows considerable (500 – 1000 times) reduction of a likelihood of the damage to the active area of the reactor;
- combination of functions of the standard operation and safety systems to decrease a likelihood of a failure, to reduce amount of equipment and to simplify power unit systems;
- introduction of new monitoring and diagnostic systems, pipelines of the primary circuit and fittings;
- water lubrication of bearings of the main circulating pumps.

The listed technical solutions reflect their progressive character and a trend towards higher safety standards with regard to global tendencies.

The main technical and engineering specifications of the nuclear power plant - 2006:

- Installed rated power of the power unit - 1200 megawatts.
- Number of power units - 2.
- Operating life of the power unit - 50 years.
- Efficiency factor – 33,9 %
- Annual average readiness factor at the installed rated power - 0,92.
- Electricity consumption for internal needs – no more than 7,48% of the rated power.

4 INDUSTRIAL AND ECONOMIC CHARACTERITICS OF THE OSTROVETS SITE FOR THE NUCLEAR POWER PLANT

The site of the Belarusian nuclear power plant (picture 1) is situated in the north-west of the Republic of Belarus, in the center of the Ostrovets district and the Grodno oblast.

The distance to the borders of the neighbouring states:

The Republic of Lithuania – 23 km;

The Republic of Latvia – 110 km;

The Republic of Poland – 200 km.

To the north the nuclear power plant site is limited by the republican auto route P45 "Polotsk-Glubokoye – border with the Republic of Lithuania (Kotlovka)", to the east – by the local auto route H-6210 "Mikhalishki-Gervyaty-Isobelino", to south and west – by population centers Voleykuny and Goza respectively.

The double line railway "Ukraine border - Gomel-Minsk – border of the Republic of Lithuania" runs at a distance of 30 kilometers to the south from the site of the Belarusian nuclear plant.

Enterprises of the Ostrovets district and some enterprises, situated in rural settlements of the Smorgon district of the Grodno oblast account for the industrial capacity of the territory within the 30-km area of the Belarusian nuclear power plant. The Ostrovets district industry is represented by 14 industrial enterprises (including small ones), whose basic activity is industrial production.

The total territory of the Ostrovets district, parts of the Smorgon and Oshmyany districts, the Myadel district of the Minsk oblast, and the Postavy district of the Vitebsk oblast are included in the 30-km area of the Belarusian nuclear power plant.

Land reserves of the indicated area are 215,37 thousand hectares, including:

– lands of agricultural organizations - 86,31 thousand hectares (40,1 %);

– private lands –10,42 thousand hectares (4,8 %);

– lands of state forestries – 109,37 thousand hectares (50,8 %);

– lands for industrial, transport, communications, energy, defense and other uses – 5,15 thousand hectares (2,4 %);

– lands of general use in population centers - 3,19 thousand hectares (1,5 %);

– reserve lands – 0,66 thousand hectares (0,3 %);

– lands used for nature protection, recreational, historical and cultural purposes – 0,27 thousand hectares (0,1 %).

The major part of the territory is covered by forests and arable lands (around 90%), where active work is carried out.

The agricultural organizations specialize in growing grain, flax, sugar beets, rape, potatoes, feed crop, milk and meat production.

The agricultural enterprises, situated on the studied area, manufactured crop and animal products for around 66 billion rubles in 2008. Animal products account for 52,7% of the output, while crops production – for 47,3%. Private farms account for 3.4% of the agricultural output of the oblast.

5 OVERALL ENVIRONMENTAL ASSESSMENT OF THE MONITORING AREA FOR THE BELARUSIAN NUCLEAR POWER PLANT

The area of the required site for the construction of the Belarusian nuclear power plant is 449,94 hectares according to the location selection act, arable lands cover 359,75 ha, forest fund lands occupy 88,80 ha and lands of settlements, horticultural societies and summer houses areas cover 1,39 ha.

The nuclear power plant site is wholly situated within one landscape province - the lacustrine province of glaciolacustrine, morainic, and hilly morainic lacustrine landscape. According to their heights, the region landscapes belong to all three landscape groups situated on the territory of the Republic of Belarus - elevated, medium-high, and low. Elevated landscapes occupy its border areas – north-east and south-west. Inwards, they are replaced by middle height and low landscapes.

The areas occupied by the main vegetation types (forest, meadow, wetlands, and water) have remained practically the same lately. Within the structure of the land reserves of the test ground (within the borders of the Republic of Belarus) natural ground vegetation covers 112,6 thousand hectares (45,9 %), including forests - 92,6 thousand hectares (37,73 %), wetlands – 16,4 thousand hectares (6,68 %), meadows – 3,6 thousand hectares (1,47 %).

The content of chemical pollutants and heavy metals in the soil samples, taken within the borders of the monitoring area doesn't exceed the permissible levels.

The radionuclides content in the soil samples taken at the Ostrovets site is within the following limits:

– Cesium-137 – 1,0 – 2,5 kBq/m^2 (0,027 – 0,067 Cu/km^2)

– Strontium-90 - 0,17 – 0,37 kBq/m^2 (0,005 – 0,01 Cu/km^2)

– Plutonium-238,239,240 - 0,026 – 0,074 kBq/m^2 (0,0007 – 0,002 Cu/km^2),

which corresponds to the level of natural fall-outs according to the results of the long-term observations (Cesium-137 – 0,01-0,07 Cu/km^2, Strontium-90 - 0,01- 0,05 Cu/km^2, for Plutonium isotopes – 0,001-0,002 Cu/km^2);

(note: Becquerel, short – Bq – activity unit within the SI system, equal to 1 disintegration per second;

Curie, short Cu – an off-system unit equal to $3{,}7\times10^{10}$ Bq)

The content of natural radionuclides - uranium-238, thorium-232, radium-226, kalium-40 - in the soil samples taken at the Ostrovets site is typical for the sod-podzol and sod-gleysolic soils.

The comparison of soils on the basis of activity of migration processes shows that soils with low migration ability of Cesium-137 account for around 10% of the 30-km area of the Ostrovets site, soils with moderate migration ability of this radionuclide occupy 60,4%, soils characterized by increased migration ability account for 4,4% and soils with a relatively high mobility of cesium-137 – for 25,2%.

Cesium-137 and strontium-90 specific activity in agricultural products currently doesn't exceed the values set by "Republican permissible levels of cesium and strontium radionuclides content in food products and drinking water (RPL-99)".

The analysis of research findings of the biologic components of the water ecosystems allows concluding that the water streams and water bodies of the 30-km area of the nuclear power plant function in a normal mode and are characterized by high species diversity and significant biological self-purification potential.

According to the hydrogeological division, the research territory relates to the west slope of the Belarusian hydrogeological mass. The capacity of the fresh water zone varies within wide limits from 70 meters in the north to 300 meters and more in the south. Fresh underground waters are found in deposits of the Quaternary, Cretaceous, Devonian, Silurian, Ordovician and Cambrian systems and are, as a rule, hydrogen carbonate magnesium-calcium. Their mineral content varies in the range from 0,15 to 0,76 g/dm^3. The current use of underground waters by group water intake facilities is 25-40 % of the approved commercial reserves. Considerable reserves are found at the location of the nuclear power plant, the groundwater volumes are big enough to meet demands in drinking water.

Around 35 thousand people live within the 30km monitoring area of the Ostrovets site. There are no settlements within a 1,5 km distance from the Ostrovets site, around 200 people live within a 3 km distance, around 800 people live within a 5 km distance.

The population density in the region under consideration is 15 persons per/km^2 (excluding Lithuanian population). Numerically, small settlements (less than 100 people) are predominant in the structure of settlements, their share is 85,6 %.

6 POTENTIAL ENVIRONMENTAL IMPACTS ASSESSMENT OF THE NUCLEAR POWER PLANT, PREVENTIVE AND MITIGATION MEASURES

6.1 Environmental impact during construction of the nuclear power plant

During the land development and construction of the nuclear power plant a minor impact is expected on soils, vegetation and wildlife.

These minor environmental changes are possible only within the nuclear power plant construction site. Given the fact that the territory occupied by this construction site, as compared with intact natural areas, constitutes a small part of the monitoring area of the Belarusian nuclear power plant, the indicated changes won't have adverse effects on the neighbouring ecosystems of the nuclear power plant site.

To minimize the environmental impact, compensatory measures are provided for, including dust control, watering of open storage facilities and roads in summer time, installation of local ventilation, purification of emissions, development of optimal routes for transport and machinery.

6.2 Environmental impact during operation of the nuclear power plant

The impact of the operating nuclear power plant on landscapes is insignificant. Moreover, landscapes of the adjacent territories are not affected during the standard operation of the nuclear power plant.

The main factors of the potential environmental impact caused by the nuclear power plant during its operation are: radiation, thermal, chemical (dumping of saline waters, salts fall-out due to coolers emissions), electromagnetic (within the borders of the nuclear power plant) impacts and noise (transport).

6.2.1 The nuclear power plant radiation impact on the environment and population

The nuclear power plant project ensures that the radiation impact on population and environment remains within the specified radiation doses during the standard operation or in case of possible operating disturbances or accidents, and is limited in case of accidents beyond the design basis. The radiation impact on population and environment is maintained below the specified limits.

As a rule the population exposure dose is set at 100 mSv annually (note: Sievert is the unit of the effective dose within the International system of units) for designed and constructed nuclear power plants in the world practice. These doses are set for the cumulative radiation exposure caused by atmospheric radioactive emissions and liquid discharges into surface waters by the entire nuclear power plant irrespective of the number of power units on the industrial site.

The main source of radionuclides emission into the environment is gas-aerosol coming out of a tall ventilation chimney during the standard operation of the power unit of the nuclear power plant. Annual atmospheric emissions of radionucleds are negligibly small at the operating nuclear power plants with PWR reactors.

Accidents remain within limits of the "serious accident" by the INES scale (international scale of nuclear accidents, classification introduced to assess the level of danger, 3 level) at nuclear power plants with working safety systems and localization within design modes.

According to international recommendations and national requirements for this type of accidents, protective measures for population and environment are not necessary outside the site limits.

The carried out calculations confirm the compliance of the project Nuclear power plant-2006 with European requirements (EUR) regarding NPP with light-water reactors. Thus, safety of population and environment is guaranteed during the nuclear power plant operation in conformity with the international rules and requirements.

6.2.2 Thermal impact

The power units employ circulation cooling with evaporative cooling towers. The thermal effect on the environment doesn't spread beyond a zone of 1,5 km from the cooling tower if circulation cooling with cooling towers and cooling ponds is used.

Thermal conditions of the Viliya river are not affected by discharge of unbalance waters and blowing-out of cooling towers from the nuclear power plant.

6.2.3 Chemical impact

Chemical atmospheric pollution consists of emissions made by auto transport of the nuclear power plant, diesel-generators to secure reliable power supply of the nuclear power plant, ventilation of different structures of the nuclear power plant. All the emissions are localized on the territory of the nuclear power plant (excluding automobile transport) within maximum allowable concentrations (MAC) and don't affect the environment.

6.2.4 Electromagnetic impact and noise

Electromagnetic impact and noise are registered within the nuclear power plant only on the premises where the corresponding equipment is installed. These factors are absent outside the plant and don't affect the environment.

6.2.5 Prediction estimate of expected changes in ecosystems

6.2.5.1 Landscapes

On the aggregate, landscapes, resistant to chemical pollution, are predominant in the region.

Over a long-term period, the concentration of heavy metals in mineral soils of natural ecosystems won't exceed the MAC. Critical loads of these metals on natural ecosystems will remain within the specified limits.

6.2.5.2 *Vegetation*

The calculated radiation impact on the vegetation within the 30-km zone show that, on the whole, during normal operation of the nuclear power plant, the radiation won't affect in a significant way the vegetation.

Construction and operation of the nuclear power plant will influence in a certain way the landscapes due to a large-scale construction of the nuclear power plant and related transport and residential area infrastructure as well as owing to an increase in population.

To minimize influence on the vegetation, the following measures are provided:

– introduction of a monitoring system to control changes in the vegetation within the nuclear power plant monitoring area ;

– identification and protection of rare plant species and valuable plant communities, control of their condition;

– fire-preventive measures including anti-fire forest management, fire breaks and sand mineral strips, establishment of operating monitoring system over seats of forest fires; waterlogging of disturbed peat bogs, phased out of commercial use.

6.2.5.3 *Agriculture*

The estimations show a very low release of radionuclides into the environment due to a radioactive fall-out in the process of the nuclear power plant operation. Even in case of a constant fall-out of cesium-137 on the same area during the whole time of operation of 50 years, the maximum activity of the 0-30 cm soil layer will reach 12 $Bq{\cdot}m^{-2}$, which will be less than 1%, as compared with the existing level. Strontium-90 activity in standard fall-outs is very small (several Bq daily), that is why its contribution to soil pollution is negligible.

Additional content of radionuclides in the studied types of agricultural products is expected to be at a very low level and will amount to around 10^{-4}-10^{-2} $Bq{\cdot}kg^{-1}$.

Thus, a long-tern operation of the nuclear power plant will lead to a very low increase of cesium-137 content in agricultural products (less than 1 % from the existing level); which means that its content will remain within the Republican permissible levels – the real content of radionuclides will be dozens of times lower, as compared with the permissible level.

Following the analysis of the largest accident within design basis as a possible way for radiation exposure, pretty low soil pollution is expected, comparable with the existing values of soil pollution.

6.2.5.4 *Biological components of water ecosystem*

The available data allow concluding that the water streams and water bodies within the 30-km area of the nuclear power plant are characterized by species diversity, significant biological purification potential and good water quality.

The water of the highest quality is found in the Gozovka river, then the Losha, Stracha, Viliya rivers, the lowest – in the Oshmyanka river.

Construction work will affect neither water ecosystems nor water bodies which are situated at a considerable distance from the construction site.

The Viliya river - nearest to the constriction site – flows at a distance of 6 km.

Water supply and water discharge systems will operate in a closed cycle without releases of large-volume of waste water into the Viliya river. Thus, a negative impact of the nuclear power plant on the Viliya river will be minimal.

The major environmental measures aimed at the protection of the water ecosystems are:

– construction of modern purification facilities and circulating water supply systems, reducing waste waters release into water bodies;

– dust control during construction works and other environmental measures.

If these measures are implemented, construction and operation of the nuclear power plant won't have an appreciable negative impact on the water ecosystems.

6.2.5.5 Surface waters

After putting into operation the nuclear power plant, the main type of impact on surface waters is the change of hydrological regime of water bodies which are the sources of industrial water supply for the nuclear power plant or water bodies - collectors of waste water.

Supply of drinking (up to 1050 m^3/day) and technical (during construction) water will be provided from an underground water source to the nuclear power plant in the volume of 800 m^3/ per day.

A surface water intake, situated on the left bank of the Viliya river, will be used to supply industrial water to the nuclear power plant. An approximate distance from the area of the water intake points on the Viliya river to the nuclear plant site is 6-8 kilometers. After its intake from the Viliya river, water is fed by two steel pressure water conduits with a diameter of up to 1200 mm to the water purification facility, and then to the corresponding nuclear power plant facilities.

To secure guaranteed uninterrupted water supply of the nuclear power plant the existing back-up water supply sources can be used:

– The Olkhovo channel type water reservoir at the Stracha river (the water reservoir of the Olkhovo hydroelectric power plant) – the priority source for the back-up water supply, situated at a distance of up to 18,9km (along the route of water streams) from the water intake points (active capacity of water reservoir is 1,4 million m^3, water level difference is 3,0 m, surface area is 0,7km^2, average depth – 3m);

– The Snigyanskoye channel type water reservoir at the Oshmyanka river (the water reservoir of the Rachun hydroelectric power plant), situated at a distance of up to 55 km (along the route of water streams) from the water intake points (active capacity of water reservoir is 1,21 million m^3, water level difference is 5,0 m, surface area is 0,7km^2, average depth – 1,42m).

After putting into operation the nuclear power plant, the volume of the required water intake from the Viliya river will be 2,6 m^3/s to supply water to the two power units of the nuclear power plant, which, in case of the river flow rate close to the average long-term flow rate, will be no more than 4% of the river flow rate, and no more than 8,7% for two power units in case of low or and very low water conditions.

Waste waters from the nuclear power plant will flow into the sewage pumping plant and then they will be pumped into the biological purification facilities of complete cycle with fine removal of nitrogen and phosphor and advanced purification which are planned for installation in the sanitary-protection zone of the nuclear power plant.

As the construction of the settlement for the personnel of the nuclear power plant will take place at the urban settlement Ostrovets, purification of waste water produced by the settlement will be carried out by the existing treatment facilities after their upgrading and expanding.

The use of modern purification facilities ensures the minimal impact on surface waters.

6.2.5.6 Underground waters

The study showed that the "Ostovetsky" underground water intake facility won't have appreciable influence on the water level regime of the neighbouring territories, including the site of the Belarusian nuclear power plant, and it won't affect significantly the common regional hydrodynamic pattern of groundwater flows.

The influence of the water intake facility will remain insignificant even after 50 years of operation.

The impact from the "Ostrovetsky" water intake facility will be registered at an averaged distance of 3 km in the first water-bearing layer and at a distance of 4 km in the water-bearing layer being used. This water intake facility won't affect the nuclear power plant site and territories of the neighbouring states.

Chemical pollution of the first from the surface, contained, Dnepro-Sozh water bearing layer is not expected.

7 TRANSBOUNDARY IMPACT

During the period of construction, under normal operating conditions and during putting out of service period of the Belarusian nuclear power plant there will be no transboundary impact on the territory of the cross-border states because of their significant remoteness from the plant.

A part of the territory of the Republic of Lithuania is within the 30-km area of the Belarusian nuclear power plant. That is why this section deals with the issue of the impact the Belarusian nuclear power plant has on that country.

The forecast for the Viliya river speed regime in case of the construction of the Belarusian nuclear power plant showed insignificant reduction in the average speed of its flow (maximum – for 0,04 meters/sec) on the river stretch below the water intake facilities and an insignificant change at the trounsboundary section.

The forecast for the water quality showed that in case of release of purified waste waters of the Belarusian nuclear power plant during its construction and operation, practically complete mix with the river waters will take place at a distance of up to 10,4 km from the discharge point (on the Belarusian territory). It is not expected that the water quality will change at the transboundary section, if compared with the present level.

The cooling towers impact will be felt at a distance of 1,5 kilometers from them (estimation made from the experience of operation of similar nuclear power plants) that is why the territory of the Republic of Lithuania won't be affected.

According to the findings of the study, the conditions are not detected for formation and transit of the ground waters of the Dnepr-Sozh, Berezina-Dnepr and combined Pre-Quaternary water-bearing complexes from Belarus towards Lithuania within the borders of the largest part of the 30-km area, as a result, transboundary migration of pollutants with ground waters is not expected.

The result of analysis of exposure doses in case of peak emergency emissions showed that the countermeasures by way of sheltering, deactivation and/or population evacuation won't be necessary.

During the first seven days after the accident within 20-km area round the plant the maximum calculated exposure dose of the thyroid gland will exceed 50 mSv at a distance of 20 km from the plant in accordance with the specified scenarios of the beyond the design accident, therefore, at an early stage of an accident iodine preventive treatment will be a necessary countermeasure.

8 RADIOACTIVE WASTE HANDLING (RWH)

Solid radioactive waste (SRW) and liquid radioactive waste (LRW) are formed during operation of the power unit. LRW is transformed into SRW, and the forming condensate is returned into the technologic cycles. All the SRW are placed in the designed storage on the territory of the nuclear power plant.

The total annual volume of treated radioactive low-level and medium-level activity of the Belarusian nuclear plant won't exceed 60m^3; the annual volume of high-activity SRW is 1 m^3.

The storage facilities for RAW will be designed according to other tasks and are not included in this EIA report.

9 ENVIRONMENTAL PROTECTIVE MEASURES

The following solutions, which will be implemented within the project of the Belarusian nuclear power plant, belong to environmental protective measures:

– natural landscapes preservation efforts;

– reclamation and recultivation of disturbed lands;

– protective measures aimed to prevent the release of radioactive and chemical waste into the environment during the standard operation of the plant;

– high-degree of waste purification which ensures that the content of radioactive products in the atmosphere is considerably lower than the permissible levels;

– prevention of radionuclides release into the environment with wastes;

– storage of SRW in packing and facilities, preventing their release into the environment;

– efforts on bringing the levels of non-radioactive pollutants below the maximum permissible concentrations;

– complex ecologic monitoring of the environment.

Purified water is used in the system of circulating water supply. After radioactive control, dewatered sludge is taken to an industrial waste dump.

10 GENERALIZED ENVIRONMENTAL SAFETY CHARACTERISTICS OF THE NUCLEAR POWER PLANT

During the normal operation, the nuclear power plant is the source of three main types of environmental impacts: radiation impact, chemical impact and thermal-humidity impact. Impacts caused by electromagnetic emissions, noise and atmospheric emissions of impurities from accessory buildings and structures are insignificant and don't spread beyond the borders of the nuclear power plant site.

The environmental forecast and analysis of the living conditions of population allow classifying the Belarusian nuclear power plant as environmentally safe according to the current regulatory documents of Belarus.

The nuclear power plant practically has no impact on the living conditions in the region: radiation impact is minor, impacts caused by chemical substances are not detected, thermal impacts don't pose a threat for the population. Natural complexes (mostly terrestrial) are a subject to an industrial impact at the time of the nuclear power plant construction, but changes in their composition, structure and functional arrangement are within the permissible levels.

Pursuant to the Law of the Republic of Belarus of July 30, 2008 "On nuclear energy use" and regulations on nuclear plants construction, the project specifies a sanitary-protection zone and monitoring area for the construction of the Belarusian nuclear power plant. In the monitoring area there is a constant control over radiation parameters.

The design solutions for nuclear and radiation safety ensure the safety level, corresponding to the requirements of the existing legislation and technical regulations.

The engineering solutions ensure the minimal water consumption for the nuclear power plant needs. The waste volumes are minimized.

11 PROPOSALS TO ORGANIZE AN ENVIRONMENTAL MONITORING PROGRAM

The following measures are provided for to carry out constant control and to forecast a radiation situation on the territory of the Belarusian nuclear power plant and in the monitoring area:

– setting up the system of radiation monitoring and putting into operation the automatic system of the radiation control;

– control over all radiation parameters of the environment, including gamma-radiation intensity, radioactive aerosols, and natural fall-outs from atmospheric air, ground waters, surface waters (water, bottom silt), soils and vegetation.

Detailed proposals are given in the EIA materials for the environmental monitoring program. At the sites of nuclear power plants this program must include monitoring of subsystems for the presence of the main influencing factors (radiation, chemical substances, heat) and reaction of ecosystems (biological monitoring) to changing environmental parameters.

12 SOCIAL AND ECONOMIC CONSEQUENCES OF THE PROJECT

Putting into operation the Belarusian nuclear power plant will ensure economic and social development of the northwest region of the Republic of Belarus in near future.

New infrastructure of the industrial area of the Ostrovets urban settlement will be built during the construction of the nuclear power plant.

It is planned to create a significant amount of jobs for qualified personnel both during construction of the Belarusian nuclear power plant and at the time of its operation.

Putting into operation the Belarusian nuclear power plant will lead to an increase in population of the Ostrovets urban settlement to around 30 thousand people and to adequate social development of the region.

The estimated time to put into operation the power units of the Belarusian nuclear power plant:

– power unit No. 1 – 2016;

– power unit No. 2 – 2018.

The development of nuclear power is predetermined in the Republic of Belarus because of the following factors:

– Belarus has little volumes of domestic fuel resources;

– there is the necessity to diversify energy resources and to replace a part of imported natural fossil fuels – natural gas and oil;

– the nuclear power plant will allow reduction in electric power production costs;

– there will be capacity to export electric power.

The nuclear fuel in the energy balance of the Republic of Belarus will allow enhancing economic and energy security of the country along the following directions:

– significant part of imported energy resources will be replaced (up to 5 million tons of fuel equivalent annually); the structure of the energy balance of the country will change;

– introduction of the nuclear power plant into the energy balance will lead to the reduction in production costs of electric power due to reduction in fuel costs;

– work of nuclear power plants much less depends on uninterrupted supply and fuel price fluctuations then work of fossil power plants.

Moreover, a drop in the consumption of organic fuels (natural gas) caused by putting into operation the nuclear power plant will lead to reduction in greenhouse gas emissions into atmosphere by 16 – 24 million tons, which complies with the requirements of the Kyoto protocol to the United Nations framework convention on climate change as of 11 December 1997, signed by the Republic of Belarus.

Республика Беларусь – Republic of Belarus
Физическая карта – Physical map
Обзорный план района – General district plan
Верхнедвинский пункт - Verkhnedvinsk location
Островецкий пункт – Ostrovets location
Островецкая площадка – Ostrovets site
Шкловско-Горецкий пункт - Shklov-Gorki location
Кукшиновская площадка - Kukshinovo site
Быховский пункт – Bykhov location
Краснополянская площадка - Krasnaya Polyana site